

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-172869

(43)Date of publication of application : 23.06.2000

(51)Int.Cl. G06T 13/00
G06T 11/80
G10H 1/00

(21)Application number : 11-077547 (71)Applicant : YAMAHA CORP
(22)Date of filing : 23.03.1999 (72)Inventor : MIYAKI TSUTOMU
SUZUKI HIDEO
ISOZAKI YOSHIMASA
SEKINE SATOSHI

(30)Priority

Priority number : 10274996 Priority date : 29.09.1998 Priority country : JP

(54) GENERATING DEVICE AND REPRODUCING DEVICE FOR PLAYING IMAGE INFORMATION

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain the playing image information generating device which can play music and display image formation showing the state of the playing by generating playing formation on the music to be played and operation description information corresponding to the playing style and generating sequence formation including the operation description information and playing formation.

SOLUTION: When sequence data by parts begin to be generated the playing formation is generated first (S21). Consequently playing formation on the parts is generated. The playing styles of music of the composed parts are determined (S22). Operation components corresponding to the inputted playing formation and playing styles are selected and read out of an operation component data base 20 to generate a basic operation waveform to be arranged and on the basis of the basic operation waveform a 3D image showing the state of the playing is generated (S23). Image editing processes such as arranging processes for operation waveform by the parts alterations of coordinates of respective positions or parts and the change of the position of a muting marker are performed (S25).

CLAIMS

[Claim(s)]

[Claim 1] A performance picture information preparation device characterized by comprising the following for creating performance picture information for displaying a picture which shows a situation of a performance of this musical piece with a performance of a musical piece.

It has an operation-parts database which stores operation parts which recorded a locus of operation by which every musical instrument or a player [in / whole part / the typical rendition] and a musical instrument were subdivided. A means to create behavioral description information by which information which specifies said operation parts corresponding to the performance information and rendition on a time schedule which makes a unit musical time bases which should be performed such as ** of a musical piece or a vibrant tune has been arranged. This behavioral description information and said performance information.

[Claim 2] Said performance picture information preparation device according to claim 1 wherein a means to create said behavioral description information is made as [store / by using an edit result as operation parts / in said operation-parts database / it / it has the function to edit said specified operation parts and].

[Claim 3] Said performance picture information preparation device according to claim 1 wherein said operation parts record a locus of operation for each part of said player's body or each part of said musical instrument.

[Claim 4] Said performance picture information preparation device according to claim 1 wherein said operation parts have a silence point marker in which a waveform showing a locus of said subdivided operation of operation a pronunciation point marker in which timing of pronunciation is shown and timing of silence are shown.

[Claim 5] Said performance picture information preparation device according to claim 1 wherein setting out to each of time resolution of a waveform of operation in said operation parts is enabled.

[Claim 6] On said time schedule have a means to create scene information by which scene parts in said pictures such as background information and light source information have been arranged and said sequence information. Said performance picture information preparation device according to claim 1 including said performance information, said behavioral description information and said scene information.

[Claim 7] Said performance picture information preparation device according to claim 6 wherein information which directs to display information inputted from the outside as said scene part is included.

[Claim 8] A performance picture information preparation device characterized by comprising the following for creating performance picture information for displaying a picture with a performance of a musical piece synchronizing with a performance of this musical piece.

A means to create information by which information which directs to display

picture information inputted from the outside on a time schedule which makes a unit musical time bases which should be performed such as ** of a musical piece or a vibrant tune has been arranged.

Created this information and performance information of said musical piece.

[Claim 9] Said performance picture information preparation device according to claim 8 wherein said information to direct includes information which controls a visual effect over information inputted from said outside.

[Claim 10] It has a means to create behavioral description information by which information which specifies operation parts which recorded a locus of operation by which a player corresponding to the performance information and rendition and a musical instrument were subdivided on a time schedule which makes a unit musical time bases which should be performed such as ** of a musical piece or a vibrant tune has been arranged. Said performance picture information preparation device according to claim 8 wherein said sequence information includes information by which said information to direct has been arranged and said behavioral description information.

[Claim 11] A performance picture-information reproducing device which is provided with the following and characterized by said picture preparing part creating said picture using said operation parts read from said operation-parts database based on said behavioral description information.

Based on sequence information including behavioral description information for displaying a picture which shows a situation of a performance of a musical piece corresponding to performance information and this performance information. A musical sound generating part which is a performance picture-information reproducing device which displays a picture which shows a situation of the performance while generating musical tone corresponding to the performance information concerned and creates musical tone based on said performance information.

A picture preparing part which creates a picture which shows a situation of a performance corresponding to said performance information based on said behavioral description information.

An operation-parts database which stores operation parts which recorded a locus of operation by which a player and a musical instrument in the typical rendition were subdivided for every musical instrument or every part.

[Claim 12] Said performance picture-information reproducing device according to claim 11 wherein said picture preparing part amends skeleton data in which a size of a player and a musical instrument which are contained in said operation parts is shown based on information which specifies a size of a display image contained in said sequence information and creates a display image.

[Claim 13] Said performance picture-information reproducing device according to claim 11 characterized by comprising the following.

An input means which inputs picture information from the device exterior.

An image compositing means which combines a picture created by said picture preparing part and a picture from said input means.

A means to give a visual effect to timing specified by a musical time basis of a musical piece to perform to a picture combined by a picture created by said picture preparing part a picture from said input means or said synthesizing means based on said sequence information.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the performance picture information preparation device and playback equipment which can create edit and reproduce picture information such as a picture which shows the situation of a performance of performance information and the musical piece concerned.

[0002]

[Description of the Prior Art] Conventionally the application program called the multimedia authoring tool which sticks 2 in all dimensional images and a movie on the musical piece is known using general purpose computers such as a personal computer.

[0003]

[Problem(s) to be Solved by the Invention] In the application program mentioned above as a picture displayed with a musical piece it is a still picture or the image data of two-dimensional (2D) and the picture of three-dimensional (3D) was not able to be displayed. When editing a display image editing according to the performance of a musical piece was not easy. It was difficult to synchronize the picture to display and the musical piece to perform thoroughly. For example it was difficult to set a display image by the change when the playing tempo of a musical piece is changed or to give this effect synchronizing with a performance when giving a visual effect to a picture.

[0004] Then an object of this invention is to provide the performance picture information preparation device and playback equipment which can display the picture information which shows the situation of the performance with the performance of a musical piece. It aims at providing the performance picture information preparation device and playback equipment into which a picture can be edited according to a musical piece. Reproducing a picture synchronizing with the performance of a musical piece or giving a visual effect aims at providing the performance picture information preparation device and playback equipment which can be performed easily.

[0005]

[Means for Solving the Problem] To achieve the above objects a performance picture information preparation device of this invention It is a performance picture

information preparation device for creating performance picture information for displaying a picture which shows a situation of a performance of this musical piece with a performance of a musical piece. It has an operation-parts database which stores operation parts which recorded a locus of operation by which every musical instrument or a player [in / whole part / the typical rendition] and a musical instrument were subdivided. A means to create behavioral description information by which information which specifies said operation parts corresponding to the performance information and rendition on a time schedule which makes a unit musical time bases which should be performed such as ** of a musical piece or a vibrant tune has been arranged. It has a means to create sequence information including this behavioral description information and said performance information.

[0006] A means to create said behavioral description information has the function to edit said specified operation parts and is made as [store / in said operation-parts database / it / by using an edit result as operation parts]. Said operation parts were having a locus of operation for each part of said player's body or each part of said musical instrument recorded. Said operation parts have a silence point marker in which a waveform showing a locus of subdivided operation of operation a pronunciation point marker in which timing of pronunciation is shown and timing of silence are shown further again. Setting out to each of time resolution of a waveform of operation in said operation parts is enabled further again. It shall have a means to create further again scene information by which scene parts in said pictures such as background information and light source information have been arranged on said time schedule and as for said sequence information said performance information said behavioral description information and said scene information shall be included. Information which directs to display further again information inputted from the outside as said scene part is included.

[0007] Further again other performance picture information preparation devices of this invention. It is a performance picture information preparation device for creating performance picture information for displaying a picture with a performance of a musical piece synchronizing with a performance of this musical piece. A means to create information by which information which directs to display picture information inputted from the outside on a time schedule which makes a unit musical time bases which should be performed such as ** of a musical piece or a vibrant tune has been arranged. It has a means to create sequence information including created this information and performance information of said musical piece. Said information to direct includes further again information which controls a visual effect over information inputted from said outside. Further again It has a means to create behavioral description information by which information which specifies operation parts which recorded a locus of operation by which a player corresponding to the performance information and rendition and a musical instrument were subdivided on a time schedule which makes a unit musical time bases which should be performed such as ** of a musical piece or a vibrant tune has been arranged. Said sequence information is having information by which said information to direct has been arranged and said behavioral description

information included.

[0008] Further again a performance picture-information reproducing device of this invention Based on sequence information including behavioral description information for displaying a picture which shows a situation of a performance of a musical piece corresponding to performance information and this performance information A musical sound generating part which is a performance picture-information reproducing device which displays a picture which shows a situation of the performance while generating musical tone corresponding to the performance information concerned and creates musical tone based on said performance information A picture preparing part which creates a picture which shows a situation of a performance corresponding to said performance information based on said behavioral description information It has an operation-parts database which stores operation parts which recorded a locus of operation by which a player and a musical instrument in the typical rendition were subdivided for every musical instrument or every part Said picture preparing part creates said picture using said operation parts read from said operation-parts database based on said behavioral description information. Said picture preparing part amends skeleton data in which a size of a player and a musical instrument which are contained in said operation parts is shown based on information which specifies a size of a display image contained in said sequence information and creates a display image further again. Furthermore an input means which inputs picture information from the device exterior An image compositing means which combines a picture created by said picture preparing part and a picture from said input means Based on said sequence information it has a means to give a visual effect to timing specified by a musical time basis of a musical piece to perform to a picture combined by a picture created by said picture preparing part a picture from said input means or said synthesizing means.

[0009]

[Embodiment of the Invention] Drawing 1 is a block diagram showing an example of the composition of a device which operates as the performance picture information preparation device and playback equipment of this invention. A central processing unit (CPU) with which 1 controls operation of this whole device in this figure Program storage which memorizes the control program with which 2 controls this device The sequence data in which 3 is created using this device (sequence information) The operation-parts database which parts-sized the locus of the playing action in each rendition and stored it The scene part database which stored scene parts such as background information and light source information While memorizing other various data the memory storage which consists of ROM RAM etc. which are used as workspace and 4 are operation switch groups which consist of various kinds of handlers provided in the keyboard (keyboard) and the navigational panel. 5 is a sound source part and generates the musical sound signal for two or more channels. This sound source part may be a thing of what kind of methods such as a waveform memory method FM method a physical model method a harmonics composite system a formant composite system and an analog

synthesizer method of VCO+VCF+VCA. It is not restricted to the sound source circuit constituted using hardware for exclusive use and may be constituted by the program of the sound source circuit constituted using DSP and the micro program or CPU and software. The effect processing part for giving various kinds of effects such as a vibrato and RIBABU to the generated musical tone is also contained in this sound source part 5. 6 is a sound system for carrying out sound emission of the musical tone outputted from said sound source part 5.

[0010] The image arithmetic unit (drawing engine) for 7 generating 3D image data or adding various kinds of visual effects and 8 are image display devices (graphic display) which display 3D picture generated by the image arithmetic unit 7 the screen for edit mentioned later etc. It may be made to make said CPU 1 perform image processing without using said image arithmetic unit 7. It is a MIDI interface circuit for 9 to perform external storage such as a hard disk a floppy disk CD-ROM MO and DVD and for 10 perform communication with external MIDI apparatus. A video interface circuit for 11 to display the picture which shows the situation of said performance to the monitor 12 connected outside a picture and video input device such as a television camera for 13 to input a picture or a video signal from the device exterior and VTR and 14 are the buses for performing the data communications between said each component.

[0011] In this invention constituted in this way it has the operation-parts database which stored the operation parts which recorded the locus of the operation by which the player and musical instrument in the typical rendition were subdivided for every musical instrument or every part. And the performance picture information preparation device of this invention reads the operation parts corresponding to performance information and the specified rendition from this operation-parts database Edit creation of the behavioral description information which shows the situation of a performance of the musical piece based on these operation parts is carried out and the sequence information which has said performance information and behavioral description information is outputted. The performance picture-information reproducing device of this invention generates the picture which reads operation parts corresponding from said operation-parts database based on the behavioral description information included in said sequence information and corresponds Synchronizing with the performance of a musical piece the repeat display of the picture inputted is carried out from the generated this picture and the outside.

[0012] [Operation-parts database] Said operation-parts database is explained first. This operation-parts database the locus of operation of the player and musical instrument in that typical rendition for every various musical instruments or every part incorporating as for example motion capture data -- each part of a player's body or each part (it is hereafter called a "part") of a musical instrument -- each time while decomposing an operation locus into x y and z shaft orientations it is this ***** about the timing (for example the case of a drum RBI position) of pronunciation and silence -- marking is carried out to data and it puts in a database. Here a waveform of operation and the subdivided data of a playing action

are called "operation parts" for the operation locus decomposed into each shaft orientations of said xyz.

[0013] Drawing 2 is a figure showing an example of the operation parts of a drum part. As known well to the typical rendition of a drum. As there are roll rendition (a single stroke a double stroke) rim shot rendition (a closed rim shot an open rim shot) mallet rendition brush rendition etc. and it is shown in this figure Each operation parts are constituted by the data of pronunciation a silence point marker etc. in which the timing of the waveform of operation by each rendition which shows the player at the time of the pattern performance and the operation locus of a musical instrument for every short performance pattern pronunciation and silence is shown. In the drum part shown in this example although the waveform of two or more musical instrumentssuch as cymbal a snare drum and a bass drum of operation is used as one operation parts in the case of musical instrumentssuch as a piano and sax operation parts are generated for every musical instrument.

[0014] The preparation method of said operation parts is explained with reference to the flow chart of drawing 3. First in Step S11 a player's when the player's is performing by specific rendition by the specific musical instrument operation and operation of a musical instrument are acquired as motion capture data. (a) of drawing 4 is a figure for explaining that situation as shown in this figure it equips the important section (square and shown position) of a player's body with 3D digitizer has the specific pattern subdivided by said specific rendition performed and records a motion of the body of the player at that time. The magnetic thing or the optical thing is known as a 3D digitizer. (b) of drawing 4 is a figure showing the example in the case of recording operation of a musical instrument and shows the case where shake operation of cymbal is recorded in this case. In this case it is square and three 3D digitizers attached to the shown position perform motion capturing. And in Step S12 in the motion capture data which was carried out in this way and acquired the locus of the central point of each part is decomposed into a xyz coordinate system and the waveform of operation which shows the movement state and position of each part is acquired. At this time temporal data may also be recorded simultaneously. In the example of said cymbal the waveform of said center position A of three points of operation is made into the waveform of a part of operation and three points are treated as what constitutes the same flat surface as A. The skeleton size information which shows the size of the target player or a musical instrument is also recorded.

[0015] Next it progresses to Step S13 It is remembered as a marker (it is called a pronunciation point marker or a silence point marker) that the coordinates of the key-point part of the position (pronunciation point) from which pronunciation took place and the position (silence point) of silence and the lapsed time from the performance start can be distinguished. For example when it is the performance of the phrase shown in (c) of drawing 4 three positions shown in a figure serve as a pronunciation point and each lapsed time t' and t'' are memorized so that distinction is possible. As long as this pronunciation point marker and the silence point marker can specify the timing of pronunciation and silence now within a set

of said acquired data point (xyz) of operation they may be a thing of what kind of form. And it progresses to Step S14 and matching with the data acquired as mentioned above and the performed rendition is performed. At this time parts which have a close relation mutually such as each joint of a right arm shoulder, elbow, wrist and a finger are summarized and they are stored as a set part for example. The operator can rearrange this set part arbitrarily or can decompose. [0016] Thus it puts in a database as data of form which can respond to change (change of the shape of a player and a musical instrument or a size) of the position at the time of reproduction or change (change of tempo) of time. For example operation until it finishes striking the operation parts about a drum from the operation which strikes each kit is stored as operation parts. For example since the stick was flung up cymbal strikes cymbal and the period until it flings up a stick again becomes operation parts. Here the time of a stick hitting cymbal serves as a pronunciation point. Although it is not necessary to necessarily provide about a silence point, timing which vibration of cymbal stopped can also be considered as a silence point. About a piano the operation by the place which separates a keyboard from the place which is flipping the keyboard serves as operation parts to each finger (1 or two combination). Here the timing to which the finger was equivalent to the keyboard serves as a pronunciation point and the timing in which the finger carried out key-release serves as a silence point. And two or more variations are prepared according to the difference condition of a finger when flipping respectively and the state of the remaining fingers. To the typical code using three or more fingers two or more variations are prepared for the state of the finger which is flipping it in finger usage or the difference condition of a finger. It may be made to also include the data of the movement speed for every part acceleration etc. mentioned above in said operation parts besides each data of xyz coordinates and time and skeleton size and pronunciation and a silence point marker. The data about the shape and textures of a player or a musical instrument is also recorded.

[0017] [Creation of sequence data] Next creation processing of said sequence data is explained. Drawing 5 is a flow chart which shows creation processing of sequence data. As shown in this figure creation of sequence data is divided roughly into creation processing of the sequence data of all the parts which unify the sequence data of creation processing of the sequence data for every part and each created part.

[0018] (a) of drawing 5 is a flow chart of creation processing of the sequence data for every part. A start of creation processing of the sequence data for every part of this will perform creation processing of the performance information of Step S21 first. It is the same processing as composition of the musical piece to which this processing is performed in the usual sequence software and thereby the performance information (MIDI data) of this part is created.

[0019] Then it progresses to Step S22 and the rendition of the musical piece of this part composed in said step S21 is determined. It can opt for this determination for every field selected on the score corresponding to said performance information.

When this part is for example a keyboard part a code fingering information and information including volume etc. are inputted. In the case of a drum part the name of rendition is inputted. Since the operation parts matched from the operation-parts database 20 mentioned above by these information will be read it directs to input information required in order to search a part operation waveform from said operation-parts database 20 according to the musical instrument or part which the operator chose.

[0020] If the whole of this required information is ready will progress to Step S23 and the operation parts corresponding to said inputted performance information and rendition will be chosen and read from said operation-parts database 20. The basic motion waveform which is the target of edit is created. A 3D picture which shows the situation of the performance based on the basic motion waveform is generated and it displays on a screen. First the player by which initial setting is beforehand carried out to this musical instrument or part is displayed with the musical instrument corresponding to the tone color information directed within the performance information of said musical piece. The operator can change into other players and musical instruments when the player or musical instrument of a basic motion waveform is not pleasing (Step S24). However about the musical instrument top priority is given to the directions information in the musical piece concerned. For example when directions information is grand piano it is possible to make the graphics of grand piano into a grain tone from a black color or to change transparently but it is preventing from being changed into the upright piano and other musical instruments from which a category differs. The choice of the player and musical instrument which can be changed is displayed on a screen each time and it may be made to raise operativity at this time.

[0021] Thus after a player and a musical instrument are determined an operator reproduces this basic motion waveform briefly and when it is not pleasing he will perform that editing processing. That is it progresses to Step S25 and image editing processing such as change of the coordinates (position) of the editing processing of a waveform of operation for every part each part or a part and change of the position of a pronunciation silence marker are performed. Also when the player or musical instrument which is pleasing in said step S24 is not able to be chosen it progresses to this step S25 and it is begun directly to read operation parts and they can be edited. The result edited by this image editing processing S25 is stored in said operation-parts database 20 as new operation parts and it is made as [aim at / reuse of parts].

[0022] Drawing 6 is a figure showing the example of the image editing screen displayed on said display 8 when performing said step S23 – processing of 25. As shown in this figure in this image editing screen. Reproduction rewinding processing of a picture. The control window 30 which displays the frame position etc. of the image data used as the control button to perform or an editing object. Each part so that the image display window 40 which displays the 3D graphics picture which shows the situation of a performance the player currently displayed and a musical instrument can be chosen per part with the layered structure. Four windows of the

part part display information window 60 which displays the part of the part selection information window 50 to display and operation parts or the time schedule for every part are provided.

[0023]Here the button in which the control button 31 provided in said control window 30 returns to a head position the button in which 32 returns before 1 vibrant tune the button which 35 follows a reverse-direction-reproduction button and 34 to an earth switch and follow it to a forward direction reproduction button and in which 33 follows 36 to 1 vibrant-tune point and 37 are buttons which go to end position. The operator can control reproduction of the 3D picture information concerned in said image display window 40 by operating these buttons.

[0024]In said step S23a player (player) and a musical instrument with the selected operator are displayed on said image display window 40. At this time the skeleton size data shape and texture data which were mentioned above as initial information are used. The operator can perform change setting out of that position by choosing the part of the player and musical instrument which are displayed on this image display window 40 and shifting that position. Also by choosing the part display information in said part selection information window 50 it is supposed that it is possible to perform said selection and it becomes shade and can be considered as a selectable displaying condition in said image display window 40 about the part where it is difficult to choose by choosing by said part selection information from the picture currently displayed. Simultaneously with setting out of this position change processing of the coordinates of a waveform of operation is also performed automatically.

[0025]Each part which constitutes these operation parts is displayed on said part selection information window 50 with that layered structure and the operator is made as [choose / the part currently displayed on this window]. In the example to illustrate each part of the drum player and the drum kit is displayed hierarchical respectively.

[0026]The field 61 which displays the performance information of the part and the field 62 which displays the time schedule of each part are established in said part display information window 60. If the waveform of the part for one music of operation is created operation parts will display ** for the time schedule for every set-sized part as unit time for example. The dashed line of ***** shows ** and the solid line shows the pause of a vibrant tune. The waveform of each part of operation is arranged considering ** as a unit at the position for which the waveform of operation in the time schedule of the part is used. In drawing 663 shows the time schedule of a part called a drummer and 64 and 65 show the waveform of the part about a musical instrument of operation respectively. Each waveform of operation is displayed in the rectangle and the position is shown by the rightward triangle about what includes a pronunciation marker in it. In the illustrated example it turns out that the stick is contained in the part 63 and the position of a pronunciation marker is displayed. Therefore the performance information of the already inputted musical piece can be displayed according to a part and the timing of pronunciation and silence can be checked. If the

pronunciation marker of a waveform of operation and a silence marker are set by the timing of this pronunciation and silencegenerating of musical tonesilencethe pronunciation of the performance in a pictureand silence operation can be synchronized.

[0027]The reproduction rate of a waveform of operation of the part can be changed by choosing the rectangle which shows the waveform of each part of operationand changing the length. For examplea reproduction rate can be lessened by lengthening the length. A reproduction rate is automatically changedalso when the tempo of the musical piece concerned is changed. The straight line made square [both ends] is displayed on the inside of the rectangle of each operation waveformand this straight line expresses the portion (portion actually reproduced) used at the time of reproduction of the picture of those operation waveforms with it. By changing the length and the position of this straight linethe portion used for reproduction of those operation waveforms can be chosen. When the length of said rectangle is changedthe length of this straight line maintains that relative relationand is changed. A change of such length will be made considering musical time basessuch as ** or a vibrant tuneas a unit. Each part included in the part is made selectable in said image display window 40 by choosing said rectangle of a waveform of operation further again. Therebychanging a waveform of operation into other variation candidates for every part and edit of the waveform of operation itself are attained.

[0028]An operating frame number can also be changed for every part further again by making into a maximum the frame number by which motion capture was carried out. A frame number is made to increase about the part which operates finely by thisand the frame number of the part which seldom operates can be decreased and can make the load of an operation reduce. It explains taking the case of composition of the waveform of each part of the drum part shown in drawing 7 of operation. As shown in this figurefive kinds of waveformsooperation of human being except the (a) fingeroperation of the (b) fingeroperation of (c) stock musical instrument (drum stick)operation of (d) deferment musical instrumentand operation of the (e) flexible regionof operation are used for a drum part. At this timeoperation of human being of (a) and operation of the stick of (c) are used as the set partand the frame number is enlarged. Since operation of the (b) fingeroperation of (d) deferment musical instrumentand (e) flexible region operation do not need a high resolutionthe frame number is decreased so that it may illustrate.

[0029]The direct edition of said waveform of operation can also be carried out further again. Drawing 8 is a figure showing the situation in the case of carrying out the direct edition of this waveform of operation. Herethe case where the waveform of a part "head (HeadA)" of operation is edited is shown. If the part HeadA to edit is chosen in said part selection information window 50 or said image display window 40in order to influence the part which the low order hierarchy has by the edit result of HeadAIn said part selection information window 50the part (59 in a figure) in HeadA and its low rank is expressed as a different gestalt (for

examplewhite) from other parts. In 3D picture currently displayed on said image display window 40 corresponding to thisAs shown in [B] a figurethe field of the part (namelypart which has a relation restrained by the selected part) which the hierarchy of the this chosen part and its low rank has is displayed by a different display style (for examplethe luminosity of the field becomes high) from other parts. If the part which the operator chose is specified by double click etc.the waveform display window 70 of operation shown in drawing 8 will be displayedand the waveform of the part of operation will be displayed. The waveform of operation shown in this figure is a thing of HeadAand the movement angle to the initial coordinate position of HeadA of the direction vector which goes to HeadA from the part Sternum of that low rank (sternum) is shown. In the figurea horizontal axis shows a frame numberthe vertical axis shows the angleand three graphs showing the angle from [from a top] a x axis,the y-axisand the z-axis are shown.

[0030]If an operator makes the position of a part to edit in said image display window 40 changein connection with thissaid waveform of operation will be changed automatically. If the waveform of operation currently displayed on said waveform display window 70 of operation is edited converselythe 3D picture currently displayed on the image display window 40 according to this will operate. Thusit is also possible to carry out the direct edition of said waveform of operation. Edit of this operation waveform is effective when it compounds two or more sorts of operationsfor exampleand making that knot smooth.

[0031]Thusafter editing a waveform of operationa name can be added to the waveform of the this edited part of operationand it can add to said waveform database 20 of operation. The waveform of a part of operation is possible also for carrying out continuation composition of the two or more kindsor making it decomposeand can also add these to a database newly. Nowdetermination of the file of operation which does in this way and shows the situation of a performance of this part will memorize automatically that waveform file name of operationa pointer (instrument informationrendition)etc. corresponding to performance information.

[0032]Thusafter the sequence data according to each part is createdprocessing which unifies the sequence data of all the parts shown in (b) of drawing 5and adjusts the whole is performed. This processing is performed using the screen for edit of all the parts shown in drawing 9. In Step S31a start of this processing will perform attachment processing of the data of each part first. In this processingeach part is specifiedrespectively and both musical tone and a picture are arranged on the time schedule. In drawing 980 is a window which displays the time schedule of all the partsand the field 81 which arranges the scene information about a stageand the field 82 which displays the data of each part are formed. Here** and a solid line express the vibrant tune and a vertical dotted line will be arranged on the absolute vibrant tune within the one musical piece concernedand ** by arranging each part information here. In the edit display according to said drawing 6 and part of drawing 8relative ** from the starting point of the part and a vibrant tune are shown.

[0033]Next it progresses to Step S32 and editing processing of scene information is performed. As mentioned above the scene part database is stored in said memory storage 3 and various kinds of scene parts for forming pictures about a performance stage such as background information, information on a light source and information on a camera (viewpoint) are stored in this scene part database. Then in this step S32 scene parts such as background information, information on a camera (viewpoint) and information on a light source are chosen from said scene part database and it sticks along with ** of said field 81 and a vibrant tune. In the example shown in drawing 9 three camera information of G0-G2, two background information of G4 and the light source information of G5 are stuck on the time scheduler respectively. These scene parts are described by VRML (Virtual Reality Modeling Language).

[0034]The movie file created by the on-the-spot photo image inputted from said picture and video input devices 13 such as a television camera and VTR or computer is incorporated and the control information for using it as background information etc. is also stored as scene parts. This input on-the-spot photo image can be displayed as a background or can be displayed on viewing areas arbitrary as a part of background. For example as for what (chromakey synthesis) a photograph is taken or a CG image and an on-the-spot photo image are compounded also for with the transmissivity arbitrary in starting only colors other than the back and sticking on a picture as a background which generates computer graphics conversely the back can do single colors such as blue. If this combines the picture generated from said waveform of operation against the background of the on-the-spot photo image or human being of other musical instrument parts also incorporates as scenery (background) the scene which is on a display and is performed together with CG player can be displayed. It is also possible to make it display only an on-the-spot photo image to insert an on-the-spot photo image and to heighten a playing effect into an intro or an interlude by this. Since the control information for incorporating this on-the-spot photo image is also scene parts it is stuck like other scene parts on the time schedule in alignment with musical time bases such as ** and a vibrant tune.

[0035]Effect processing to a picture can also be used as said scene part as said scene part. This scene part can stick on said time schedule and a ***** case. The change of the viewpoint of the picture pictured on the monitor which combined said on-the-spot photo image and said generated picture and a background change and sometimes fade-in making fade-out wipe etc. process making some display images into a mosaic or making a color tone into sepia **** -- etc. -- it becomes possible to give various visual effects. The scene parts about such effect processings can be registered into said scene part database as a function and can add arbitrary processings.

[0036]About this scene part as well as the case of the part mentioned above it can choose on the time schedule of said field 81 and can edit changing that length etc. It is also possible for each detailed information to be displayed and to perform the edit by choosing the stuck scene information. Thus the completed music can

appoint a field and can perform reproductionrewindinga rapid traverseetc. A track name etc. can be given and saved.

[0037]With reference to drawing 10the case where the information on such two or more parts is compounded is explained. As shown in (a) of drawing 10a global stage coordinate system is set up and the coordinate system of the things unit which has the musical instrument or skeletal structure for every personal coordinate system for every player and player in this coordinate system is set up. Classifying said musical instrument and things into a rest frame and a braking systemthe thing of a braking system makes a flexible region the starting point of the coordinate system. Therebya coordinate changei.e.repositioningcan be freely performed in a global coordinate system. For examplein the case of the keyboard of a pianothe coordinate system which makes the starting point the portion which moves for every keyboard is set up and definedand if one kind of waveform of the keyboard of operation is preparedthe appropriation of data of it will be attained by [which apply] moving the home position for every keyboard. What is necessary is just to hold early operation about the musical instrument and things. [of a rest frame] Among thingsa musical instrumentetc.about the thing of the stock of playerssuch as a drum stick and a violina coordinate system local as the starting point is defined for a flexible region in the personal coordinate system for every playerand operation of operation parts is reproduced on this local coordinate system. When the player of each part and the size of a musical instrument are changeda ratio is calculated for every part and it amends in the size after changing the skeleton size in said operation parts.

[0038]As shown in (b) of drawing 10the sound which the player makesand operationi.e.performance information and performance informationtake a synchronizationand the package of each player of operation is package-ized. And the head position is doubled and the package of each player of operation is arranged. Thus the behavioral description information on each player and a musical instrument is unifiedand the sequence information containing all the players is created.

[0039][Composition of a sequence file] Drawing 11 is a figure showing the composition of a sequence file including the sequence information which did in this way and was created. As shown in this figurethe sequence file comprises three files(1) scene file(2) personal initial information fileand a (3) personal performance description file. And the information concerning [the scene file of (1)] this whole sequence file is includedScene informationsuch as reproduction speeda viewpoint and a viewa light sourcebackground informationand information that directs incorporation of the picture information from said outsidethe player of each part and the coordinate system position of a musical instrumentand size information are included. It may be made to hold scene informationsuch as a viewpoint and a viewa light sourceand background informationhere as pointer information to the scene parts concerned in said scene part database. The personal initial information file of (2) includes the information which determines the skeleton data of each player and a musical instrument and shapeand textures for every part. The

personal performance description file of (3) includes the performance information file and behavioral description file (behavioral description information) of the part for every part. Here the performance information file is made into MIDI data (SMF) form and the data point of a player and a musical instrument (tool) of operation by which the behavioral description file is included in said operation-parts database 20 and the pointer information to said pronunciation and a silence point marker are included.

[0040] Thus since he is trying for the sequence file of this invention to hold the information for accessing not to the picture information itself but to an operation-parts database as a behavioral description file it can make size of a sequence file small and has become a good thing of portability.

[0041] [Regeneration of sequence information] Next with reference to the flow chart of drawing 12 the processing which carries out the repeat display of a performance and picture of the musical piece concerned from the sequence data created by carrying out such is explained. In the sequence data creation processing mentioned above when a reproduction button is operated same processing is performed. Determination of the music which an operator is going to perform will choose the sequence file (regenerative data) of the musical piece concerned from the music database 21 etc. with which the sequence file corresponding to the musical piece created as mentioned above is stored. In Step S41 the sequence file (regenerative data) of this selected music is read specified length every and processing of Steps S42 and S46 is performed based on this data.

[0042] Step S46 is the automatic playing process known conventionally and the same processing and creates pronunciation events such as a key ON event and a control change and a sound-source-control parameter based on the performance information included in the read regenerative data. Thus it is inputted into said sound source part 5 corresponding musical tone is generated (Step S47) and the created sound-source-control parameter is outputted from said sound system 6.

[0043] On the other hand in Step S42 the data point of each part of operation corresponding from said operation-parts database 20 is read based on the behavioral description file in said read regenerative data (sequence file). And the compensation process of the coordinates position of a waveform of operation of each part followed and read to Step S43 is performed. When selection of a display part or the change of a view position is performed by the operator at this time the compensation process of the coordinates position according to it is performed. If specifically necessary about the waveform of each part of operation so that the reproduction rate of the part may be suited operation data will be created by performing interpolation processing and it will amend by spline interpolation etc. about a bond portion of operation further. And corresponding to the position of each part etc. compensation processes such as transmission of a coordinates position rotation and expansion are performed. The scene parts specified in said scene file are read from the scene part database 22 and scene information (stage information) is also generated. Thus in this step S23a model position is determined and animation is determined that it will correspond to it.

[0044] To each operation parts stored in the operation-parts database 20 at this time as mentioned above. They are included by not only the coordinate data in alignment with a time-axis but pronunciation and a silence point marker and with this pronunciation point marker and a silence point marker. The time or speed from the coordinates of each pronunciation point and a silence point and the reproduction start of the operation waveform to pronunciation and a silence point is acquirable. Therefore he is trying to take the synchronization with the image to generate and the musical tone to generate based on this pronunciation and a silence point marker.

[0045] Namely when the tempo performed to tempo (reference tempo) when said operation parts are created is changed into k times as much tempo. operating waveform read-out of operation on a curtailed schedule so that it may reach from said reproduction start of a waveform of operation to a pronunciation point in $1/k$ time as much time (one the speed [If it is speed] of k times of this) and the reproduction interval of the operation waveform may become short or long **** - multiple times -- what is necessary is just to control like reading the same active position When transit time or movement speed is prepared for every coordinates (i.e. when time until it moves to the following coordinates from coordinates with each part or the information on speed is included in operation parts) What is necessary is to change k times respectively at the time of $1/k$ time and speed (amendment) and just to control when it is time.

[0046] By the way it may become an unnatural picture only by controlling a time-axis simply as mentioned above about all the operations. For example if tempo is made into a half on the whole the working speed of a picture will turn into a half speed and in a performance of a drum etc. it will be a picture which is struck quietly and will be visible like the performance which stopped volume. What is necessary is to enable it to recognize the part about pronunciation operation in operation to a pronunciation point (from a pronunciation operation start point to the silence operating point) after starting operation and just to make it not change the working speed from a pronunciation operation start point to the silence operating point in order to avoid this even if it changes tempo.

[0047] It may be made to perform ornamentation of a waveform of operation using sound-source-control parameters generated in said sound-source-control parameter generation step S46 such as an envelope and a velocity. When the operation parts concerned are shake operation of cymbal for example based on musical-sound-control parameters such as a velocity or track volume When a velocity or track volume is large the shake of cymbal is enlarged and a waveform of operation is created so that a shake small if conversely small. Thereby the situation of a natural performance can be displayed.

[0048] Next it progresses to Step S44 and image generation processing (rendering) is performed using the information determined by said step S43. That is conversion to signals of a scene is performed based on said scene information and a waveform of operation. Based on said scene information or a waveform of operation namely the peak of each object The three-dimensional coordinates

calculation about a normal illumination coloring texture coordinate calculation polygon formation projection coordinates calculation view clipping bit map creation a hidden surface transmission processing etc. are processed 3D animation picture is generated and it outputs to a frame buffer. When the sizes of the player and musical instrument which are actually displayed as the size of the player and musical instrument which were created beforehand at this time differ a ratio is calculated for every part said coordinate information is amended and the difference in skeleton size is amended.

[0049] When the control signal which captures the image from said picture and video input device 13 as scene information is stuck as mentioned above To the timing specified by this scene information an on-the-spot photo image etc. are inputted from said picture and video input device 13 and if needed it compounds with the picture generated by image generation processing and outputs. When the effect processing to a picture is included in scene information in Step S45 visual effect processing is performed to the picture created in said step S44. It can express as the picture which synchronized the state of the performance with the performance as mentioned above synchronizing with composition data. This output can also be saved as movie data.

[0050] Were matched so that the candidate of operation parts might be searched and outputted when the operation-parts database 20 inputted a musical piece and rendition above but. When the new music notation item which was matched and was used as the operation parts in a database is defined and a musical score is created using the notation rule and a signa picture may also be made to be illustrated automatically.

[0051]

[Effect of the Invention] As explained above according to this invention it becomes possible to display the picture which shows the situation of the performance synchronizing with the performance of a musical piece and the natural picture which synchronized with the performance of musical tone can be displayed. The picture which shows the situation of a performance of a musical piece can be edited easily. Displaying the on-the-spot photo picture inputted from the outside synchronizing with a performance and the effect which synchronized with the performance to the picture can be added and a playing effect can be heightened. Since operation parts are put in a database further again while being able to use operation parts in common to two or more rendition and musical pieces required parts can be added to a database. Therefore it becomes possible to generate a picture efficiently. Since it has the pronunciation point marker and the silence point marker with the waveform of operation as operation parts it becomes possible to use common operation parts to change of tempo etc. and it becomes possible to make size of a database small further again.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a block diagram showing the example of composition of the 1 embodiment of the performance picture information preparation device of this invention and playback equipment.

[Drawing 2] It is a figure for explaining an operation-parts database.

[Drawing 3] It is a flow chart for explaining creation of operation parts.

[Drawing 4] It is a figure for explaining creation of operation parts.

[Drawing 5] It is a flow chart of sequence information creation processing.

[Drawing 6] It is a figure showing an example of the image editing screen for every part.

[Drawing 7] It is a figure for explaining composition of two or more operation parts.

[Drawing 8] It is a figure showing an example of the edit display of operation parts.

[Drawing 9] It is a figure showing an example of the image editing screen of all the parts.

[Drawing 10] It is a figure for explaining composition of the information on two or more parts.

[Drawing 11] It is a figure showing the composition of a sequence file.

[Drawing 12] It is a flow chart of sequence information regeneration.

[Description of Notations]

1 CPU 2 program storage and 3 Memory storage 4 operation switch groups Five sound source parts and 6 A sound system and 7 An image arithmetic unit and 8 Image display device Nine external storages 10 MIDI interface circuits and 11 [An operation-parts database 21 music databases and 22 / Scene part database] A video interface circuit and 12 A monitor and 13 A picture and a video input device and 20
